HEAT SINK STRUCTURE

BACKGROUND OF THE INVENTION

The present invention relates to an improved heat sink structure, and more particularly, to an improved heat sink structure with enhanced attachment and thermal conducting performance applied to a computer central processing unit (CPU) or other electronic heat generating device.

The fast development of computer related products such as hard disk, interface card, and central processing unit has greatly increased the amount of data being processed in logic operation and the operation speed. Consequently, the operating temperature of the internal devices of personal computer and integrated circuit device is increased. Without appropriately heat dissipation, operation of these devices are will be seriously affected to cause degradation in operation speed or lifetime. However, currently, most of the manufacturers have been focusing on how to enlarge the fan and increase the heat dissipating area to enhance heat dissipation efficiency. The important task of how to securely attach the board member with the heat sink has not been intensively reported and developed yet.

The conventional heat sink structure uses thermal conductive paste or soldering to attach two contact surfaces. The thermal conductive paste includes silver paste with thermal conductivity at about 10W/Mk, which is far inferior to that thermal conductivity of aluminum at about 237W/Mk. Therefore, thermal conduction cannot be efficiently enhanced. On the contrary, the thermal conductive paste becomes a barrier for heat conduction. Further, bubbles are easily formed while applying the thermal conductive paste. Such bubbles become the heat accumulating area to block the circulating of heat towards the heat sink. As a result, the devices may be

damaged for being overheated. Some of the thermal conductive paste is melted when the temperature of the electronic device rises up to a certain degree. The liquid thermal conductive paste is likely to damage the electronic device.

With regard to soldering connection, aluminum and copper are typically used for fabricating heat dissipating member and board member respectively, under the consideration of cost and weight. However, as the thermal expansion coefficients for aluminum and copper are different. The contact surfaces are easily deformed or detached from each other to degrade the heat dissipation effect.

BRIEF SUMMARY OF THE INVENTION

The present invention provides an improved heat sink structure. By forming embedding structures on the heat dissipating member and recessed connection structures on the board member, the heat dissipating member can be securely attached to the board member, such that the overall structure strength is enhanced, and the thermal conduction is improved.

The improved heat sink structure provided by the present invention comprises a heat dissipating member and a board member. The heat dissipating member is mounted on board member. The board member includes an upper board and a lower member. A plurality of recessed connection structures is formed in the top surface of the upper board. The heat dissipating member includes a plurality of fins and a plurality of heat circulating channels between the fins. The heat dissipating member further comprises a plurality of protruding embedding structures formed on the bottom of the fins. The embedding structures are engageable with the

connection structures to securely mount the heat dissipating member on the board member.

BRIEF DESCRIPTION OF THE DRAWINGS

These, as well as other features of the present invention, will become apparent upon reference to the drawings wherein:

Figure 1 shows an exploded view of an improved heat sink structure provided by the present invention;

Figure 2 shows the assembly of the improved heat sink structure;

Figure 3 shows a cross sectional view of the improved heat sink structure;

Figure 4 shows the improved heat sink structure and a fan; and

Figure 5 shows the operation status of the improved heat sink.

DETAILED DESCRIPTION OF THE INVENTION

Figures 1-3 show the exploded view, the assembly and the cross-sectional view of an improved heat sink structure provided by the present invention. As shown, the improved heat sink structure includes a board member 10 and a heat dissipating member 20.

The board member 10 is preferably fabricated from materials with good thermal conductivity such as aluminum or copper. The board member 10 includes an upper board 11 and a lower board 12 stacked with each other.

The board member 10 is preferably made of materials with good thermal conductivity such as aluminum or copper. The board member 10 comprises an upper board 11 and a lower board 12. The upper and lower boards 11 and 12 include hollow cuboids with an open bottom and an open

top thereof. As shown, the upper board 11 is stacked over the lower board 12 to form a cavity therebetween. Wick structure and working fluid are preferably formed and introduced in the cavity to achieve high thermal conducting efficiency. Thereby, the heat source can be instantly dissipated away from the heat generating area.

In the present invention, the top surface of the upper board 11 has a plurality of connecting parts 111. Each of the connecting parts 111 includes a recessed dovetail slot, rectangular slot or other geometric slots. In this embodiment, three dovetail slots are formed in two opposing ends and the middle of the top surface, and a plurality of rectangular slots are formed between the middle and the opposing ends.

The heat dissipating member 20 is an aluminum extruded heat sink or a stack-type heat sink. The heat dissipating member 20 includes a pair of elongate frame members 22 parallel to each other to construct two opposing sides of the heat dissipating member 20. The heat dissipating member 20 further comprises a plurality of fins 24 extending transversely from the bottom surface of one frame member 22 to that of the other frame member 22. Preferably, the top ends of each pin 24 are permanently attached to the bottom surfaces frames 22. As shown, as the fins 24 extend between the bottom surfaces of the frame member 22, the top edges of the fins 24 are thus recessed from the frame members 22 to form a recessed slot 21. A plurality of threaded holes 23 are formed on top surfaces of the frame members 22. The fins 24 are parallel to and spaced with each other by an air circulating channel 25. Therefore, from a top viewing angle, the recessed slot 21 comprises a plurality of ridges (the top edges of the fins 24) spaced with each other by a plurality of channels (the air circulating channels 25). The formation of the air circulating channels 25 provide paths for heat to

circulate upwardly and cold air to flow downwardly. The bottom edges of the fins 24 are processed with embedding parts 26 engageable with the connecting parts 111 of the upper board 11. By engaging the embedding parts 26 with the connecting parts 111, the heat dissipating member 20 is thus securely mounted to the board member 10 as shown in Figure 3.

The attachment between the board member 10 and the heat dissipating member 20 can be a cold processing. Wick structure and working fluid can be introduced into a cavity formed between the upper board 11 and the lower board. The board member 10 is then held by holding clamp while the heat dissipating member 20 is attached thereto by embedding the embedding parts 26 into the connecting parts 111 of the upper board 11. Minor adjustment is then made to secure the connection.

As shown in Figure 4, a fan 30 can be mounted on the heat dissipating member 20. As shown, a hole 31 is formed through each corner thereof. The hole 31 is aligned with the threaded holes 23 formed in the frame members 22. Fasteners such as screws can then be used to fasten the fan 30 on top of the heat dissipating member 20.

Figure 5 illustrates an operation status of the heat dissipating structure as described above. The heat dissipating structure is applied to a central processing unit of a motherboard. As shown, the bottom surface of the board member 20 is attached to the central processing unit. When heat is generated by the central processing unit, the wick structure and working fluid instantly conduct the heat from the central processing unit to the fins 24 of the heat dissipating member 20. Meanwhile, the fan is operating to blow cold air into the air circulating channels 25 to dissipate heat accumulated in the fins 24.

Therefore, the present invention has at least the following advantages.

1. The connecting parts formed on the board member and the embedding parts formed on the bottom edge of the fins provide a secure attachment between the heat dissipating member and the board member and increase contact area between the fins and the board member. Therefore, the contact strength is increased, while the heat conductivity is improved.

2. The cold process applied to the board member and the heat dissipating member avoids oxidation and deformation of the soldering surfaces caused by post processes such as acid cleaning and reformation. The cost is thus reduced.

3. The wick structure and working fluid introduced within the board member has low thermal resistance and high thermal conductivity. Therefore, heat can instantly dissipated from the source allowing the heat generating device to operate under a uniform temperature.

This disclosure provides exemplary embodiments of the present invention. The scope of this disclosure is not limited by these exemplary embodiments. Numerous variations, whether explicitly provided for by the specification or implied by the specification, such as variations in shape, structure, dimension, type of material or manufacturing process may be implemented by one of skill in the art in view of this disclosure.